

APPENDIX B.1 CALUMET-DUNES SERVICE AREA

ELEMENT 1. SERVICE AREA DESCRIPTION



The Calumet-Dunes Service Area (SA) is located in the most northwestern portion of Indiana and borders Lake Michigan. It includes all or portions of the following 8-digit HUCs:

- 04040001 – Little Calumet-Galien
- 07120003 – Chicago

The Calumet-Dunes SA includes portions of the four Indiana counties listed below in the Lake and Northern Moraine physiographic region. A fraction of Lake, Porter, and LaPorte Counties are also split with the Kankakee SA, while the majority St. Joseph County lies within the St. Joseph River SA.

Lake	Porter	LaPorte	St. Joseph
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The Calumet-Dunes SA is located in two ecoregions; the western portion is located in the Central Corn Belt Plains; the eastern portion is located in the Northern Indiana Drift Plains. The western portion of the SA is characterized by its beach ridges, marshy swales, and sand dunes; the eastern portion of the SA contains higher dunes, greater woodlands, lower relief, and less urban-industrial activity than the western portion of the SA. In addition, the eastern portion is characterized by its sandy coastal strip with beaches, beach ridges, and swales (U.S. EPA: Ecoregions of Indiana). The Calumet-Dunes SA is located within the SWAP Great Lakes Planning Region (SWAP, 2015).

Little Calumet-Galien Watershed (HUC-04040001) within Indiana drains approximately 512 square miles (327,680 acres) into Lake Michigan (Northwestern Indiana Regional Planning Commission), while the Chicago Watershed (HUC-07120003) drains 90 square miles (57,600 acres) into the Illinois River; in total, the Calumet-Dunes SA spans approximately 602 square miles, or 385,280 acres, and is the smallest of all 11 SA's.

Based on the 2011 NLCD (Homer, et al., 2015), the land cover type with the most area in the Calumet-Dunes SA is developed and impervious land use (42.76%), followed by agricultural land use (20.33%), forest and shrub/scrub (17.98%), and wetlands and open water (12.06%). Woody wetlands are the

prominent wetland type and range from approximately 6.3% of the total SA cover per the NWI, up to 10% per the 2011 NLCD. Emergent herbaceous wetlands range from approximately 0.7% per the NWI to 2.7% per the 2011 NLCD.

ELEMENT 2. THREATS TO AQUATIC RESOURCES

Aquatic resource threats specific to the Calumet-Dunes SA (SA) have been identified using the same approach as the statewide portion of the CPF. The threats are presented in the order of the current predominance within the SA.

2.1 Section 404 Permitted Impacts

The Corps Section 404 permit data for impacts that required mitigation in the Calumet-Dunes SA from 2009 – 2015 was collected and analyzed (**Table 18**). According to the data, 113 acres of impacted wetlands and 18,579 linear feet of impacted streams required mitigation during the period of analysis.

The transportation and service corridor work type accounted for the most stream impacts (85%), followed by development (15%). There were no documented stream impacts requiring mitigation for agricultural land uses, dam related activities, or energy production and mining for this time period in this SA.

Development accounted for the most wetland impacts (58.34%), followed by transportation and service corridors (41.66%). There were no documented wetland impacts requiring mitigation for agricultural land uses, dam related activities, or energy production and mining for this time period. Locations of the permitted stream and wetland impacts are provided in **Figure 21**.

Work Type Category	Authorized Stream Impacts – Linear Feet	Percent of Stream Impact per Category	Authorized Wetland Impacts - Acres	Percent of Wetland Impact per Category
Agriculture	0	0.00%	0	0.00%
Dam	0	0.00%	0	0.00%
Development	2,707	14.57%	65.98	58.34%
Energy Production	0	0.00%	0	0.00%
Transportation and Service Corridors	15,872.42	85.43%	47.12	41.66%
Grand Total	18,579.42	100.00%	113.1	100.00%

Table 18. Authorized 404 stream and wetland impacts requiring mitigation by work type category, 2009 – 2015. Source: USACE Louisville, Detroit and Chicago Districts

Calumet-Dunes Service Area

404 Permitted Aquatic Resource Impacts Requiring Mitigation

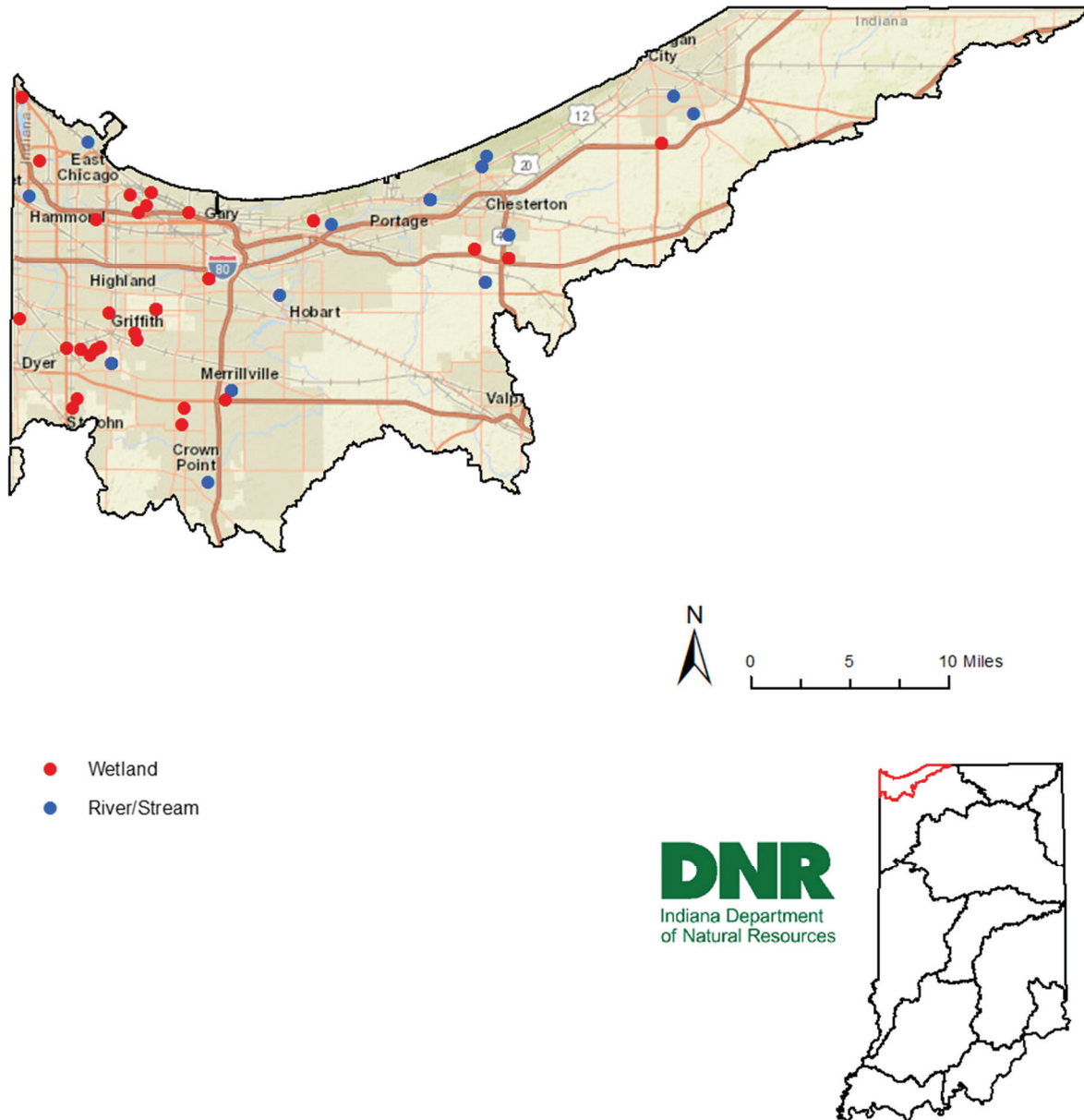


Figure 21. 404 permitted stream and wetland impacts requiring mitigation 2009- 2015

2.2 Land Cover and Land Use

In addition to 404 permitted work type categories, IDNR utilized the 2011 NLCD (Homer, et al., 2015) to identify land cover and land uses that contribute to aquatic resource and habitat impacts. Overall land cover within the Calumet-Dunes SA is presented in **Figure 22**, and displays the geographical relationship of converted cover types relative to naturally occurring cover types.

Calumet-Dunes Service Area 2011 Land Cover

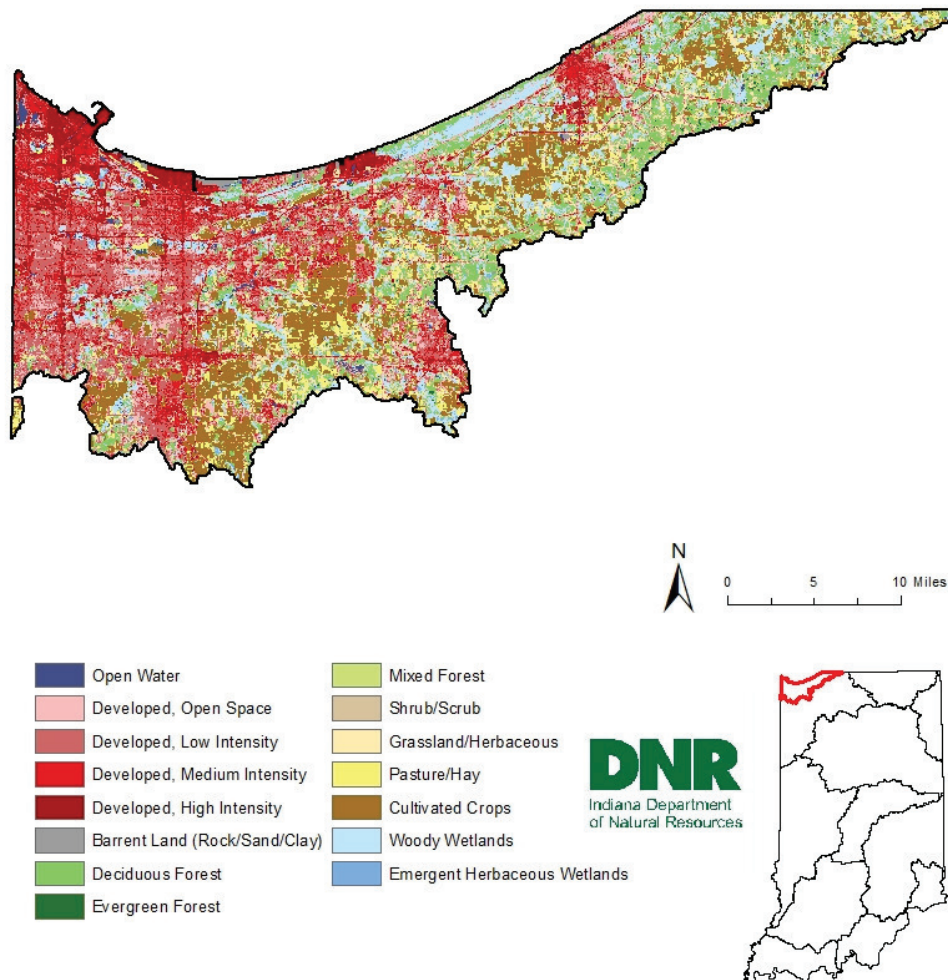


Figure 22. Land cover within the Calumet-Dunes Service Area (Homer, et al., 2015)

The land uses exhibited within the 2011 NLCD include multiple classes of cover, and some have additional values within specific classes based on variants or intensities within the classification (**Table 19**).

Land Cover			
Class	Value	Sum of Acres	Percent of Total Acres
Open Water	*	4,115	1.07%
Developed	Open Space	34,468	8.96%
Developed	Low Intensity	73,467	19.10%
Developed	Medium Intensity	36,777	9.56%
Developed	High Intensity	19,784	5.14%
Barren Land (Rock/Sand Clay)	*	2,578	0.67%
Forest	Deciduous	54,135	14.08%
Forest	Evergreen	1,402	0.36%
Forest	Mixed	768	0.20%
Shrub/Scrub	*	12,861	3.34%
Grassland/Herbaceous	*	23,802	6.19%
Pasture/Hay (Agriculture)	*	18,462	4.80%
Cultivated Crops (Agriculture)	*	59,718	15.53%
Wetlands	Woody	39,661	10.31%
Wetlands	Emergent Herbaceous	2,613	0.68%
Grand Total		384,613	100.00%

Table 19. Calumet-Dunes land cover classification/value percentages from 2011 National Land Cover Database

* Class does not have additional values (Homer, et al., 2015)

IDNR combined the values within the same land cover classification in **Figure 23** below to demonstrate the current overall land cover distribution of the SA.

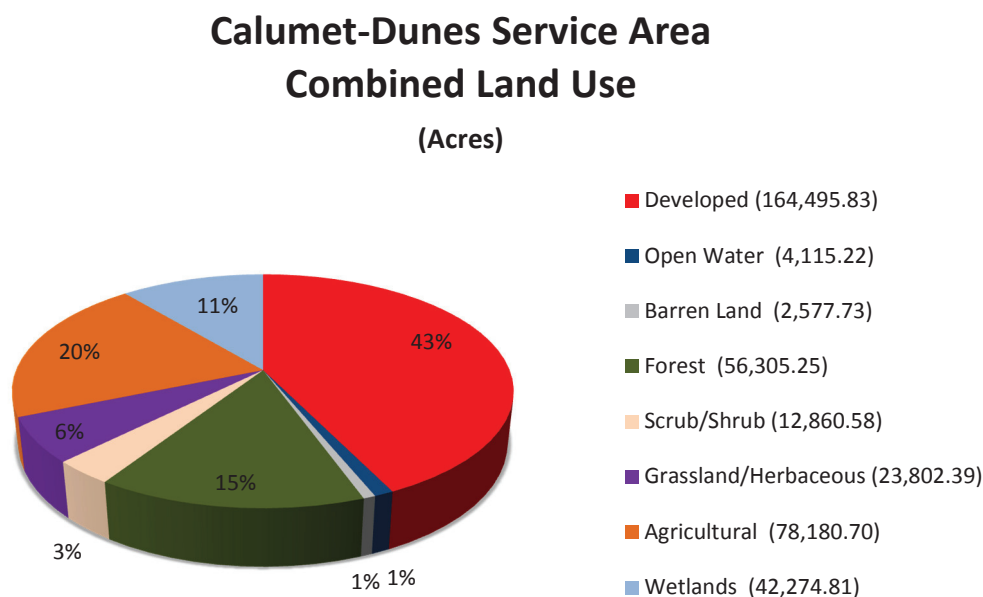


Figure 23. Combined land uses within the Calumet-Dunes service area from the 2011 NLCD (Homer, et al., 2015)

2.3 Growth and Development

The 2011 NLCD (Homer, et al., 2015) demonstrates that the dominant land use in the Calumet-Dunes SA is developed impervious area covering approximately 164,486 (43%) of the 384,613 total acres, which is the highest developed area density of any SA. (**Figure 23** and **Table 19**).

In general, urban/suburban development and land uses and their associated impervious areas are concentrated in the western two-thirds of the SA and along Lake Michigan in the north. The Calumet Dunes SA contains the Gary Metropolitan Area, the second largest metropolitan area in the state with a 2010 population size of 708,070, and part of the larger Chicago-Naperville-Arlington Heights Metropolitan Division that extends from Indiana to the southernmost county in Wisconsin along Lake Michigan with a total 2010 population of 9,461,105. The Calumet-Dunes SA also overlaps with the Michigan City-LaPorte MSA having a 2010 population of 111,476 (Manns, 2013). Analysis of the INDOT cities and towns GIS data (INDOT, 2016) shows the Calumet-Dunes SA contains entirely or in part 47 cities and/or towns, 29 of which are incorporated.

Additionally, analysis of INDOT's local roads GIS data (INDOT Road Inventory Section, 2016) shows there are approximately 4,458 miles of municipal and county roads contributing to the developed impervious land cover within the SA. The Calumet-Dunes SA has the highest local road miles to square mile ratio of all SA's at approximately 7.4 miles of local roads per square mile. This density is almost

double that of the next highest SA, further indicating that growth and development, developed land uses, and impervious surfaces are a significant threat to aquatic resources in this SA.

Prior to 1900, the Grand and Little Calumet Rivers of Indiana drained into Lake Michigan and deposited sewage and other contaminants directly into the lake. The Grand Calumet River (GCR) has been significantly altered since the early 1900s from hydromodification activities including channelization, dredging, and damming. Primary impacts to the river included habitat loss and degradation due to these alterations as well as residential and industrial development.

A 1994 report from the IDNR provided information from the mid-1900s on the status and impacts to aquatic ecosystems near the shore of Lake Michigan as well as stream resources in the Calumet-Dunes SA (IDNR Division of Water, 1994). This report noted sources of impacts which affected recreational uses of rivers included oil, grease, floating debris, and odors; sources of impacts which made these waters unfit for body contact included high coliform bacteria counts. Beaches on Lake Michigan were often closed due to high bacteria counts, and water purification facilities reported excessive ammonia concentrations near intake cribs and taste and odor problems. The causes of these impacts resulted from urban sewage disposal, channel dredging, and effluent from oil refineries and steel mills (Indiana NRC, 1996). Additional impacts reported were related to industrial development and urbanization.

The Little Calumet River has also suffered similar impacts from industrial pollution and residential establishment which have reduced the river's ecological functions and services provided to its watershed. Hydromodifications to the Little Calumet River, which include alterations due to a flood control project by the USACE and IDNR, changed flow characteristics of the river which affected the life stages of aquatic organisms and reduced the suitability of stream habitat for fish, wildlife, and botanical resources (Little Calumet River WMP, 2008).

This SA, along the Lake Michigan shoreline and especially in the northwestern portion of this SA, has experienced a long history of growth and development associated with heavy industry such as steel mills, oil refineries, chemical companies, meat packing plants, and numerous other industrial land uses since the late 1800s. Much of this industrial development in northwest Indiana is due to its close proximity to Chicago and Lake Michigan. This heavily industrialized portion of the SA has numerous Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; sites are also known as the Superfund law) sites, state clean-up sites, Resource Conservation and Recovery Act (RCRA) sites, groundwater contamination issues, and contaminated soils and sediments. While many of the sources of these sites have been eliminated and the properties are in clean-up programs, numerous legacy contamination issues do persist and pose a threat to aquatic resources in the SA.

2.4 Agricultural Land Use

Agricultural land use is the second largest land use category in the Calumet-Dunes SA. Total agricultural land use covers 22.33% of the SA's total land area of 384,613 acres (Homer, et al., 2015). Agricultural land uses occur primarily in the southern and eastern portions of the SA.

Within the identified agricultural land use areas, cultivated crops comprise 59,719 acres (15.53%) and pasture/hay lands cover 18,462 acres (4.8%) of the SA. Corn and soybean production are the primary cultivated crops within the SA, when based on harvested acres (United States Department of Agriculture, 2016 and 2017). The pasture/hay lands support livestock production for small to major livestock farms within the SA. Both dairy cattle and pig farming have active confined feeding operations (CFOs) that have a minimum of 5,000 animal units. These CFOs are considered the predominant livestock industry in the Calumet-Dunes SA (Thompson, 2008). When combining these major agricultural land use activities, the Calumet-Dunes SA ranks last in percentage of total statewide land use (0.34%), but it is a significant land use within the SA.

2.5 Transportation and Service Corridors

2.5.1 Roadways

Based on GIS analysis of INDOT's U.S. interstates and highways, state highways and local roads, there are approximately 567 miles of U.S. interstates and highways, 238 miles of state roads, and 4,458 miles of local roads within the Calumet-Dunes SA. Since this is the smallest of all the SAs, the concentration of road miles per square mile of land within the SA is substantial.

The concentration of U.S. Interstates/highways in the SA is approximately 0.94 miles per square mile, ranking it first of the eleven SAs. Although both U.S. Interstates/highways and local roads have the highest concentrations, the density of state highways is near the bottom, ranking ten of eleven, with 0.40 mile of state highways per square mile.

The Calumet-Dunes SA contains the highest density of roadways of any SA when all three road types are combined. The construction and maintenance of roads and bridges to support the primary means of transportation is in direct response to the significant growth and development throughout the region.

2.5.2 Railroads

As an alternative mode of transportation, the Calumet-Dunes SA has approximately 714 miles of railroad within the SA boundary. These active railroads provide an important means of transportation for freight and passengers throughout the SA and state. The Calumet-Dunes SA contains the greatest concentration of railroads with a density of 1.19 miles of railroad per square mile. The significant concentration of linear infrastructure throughout this SA has impacts on the aquatic resources that include habitat fragmentation and fire suppression; this has resulted in habitats that have been significantly impacted by the invasion of non-native and invasive vegetation.

2.5.3 Service Corridors

Similar to threats identified with roads and railroads, the Calumet-Dunes SA contains concentrations of service corridors. The SA has over 2,362 miles of service corridors that extend throughout its boundary.

The SA contains a network of large kilovolt (kV) electric transmission lines that includes approximately three hundred seventy one (12 kV) lines, twenty one lines (34 kV), twenty seven (345kV) lines, and one (765 kV) line (Indiana Geological Survey, 2001). These lines extend over 1,226 miles throughout the SA and contains the highest concentration of electric transmission lines relative to its size, resulting in 2.04 miles of electric transmission lines per square mile.

In addition to electric transmission lines, the Calumet-Dunes SA contains over 1,137 miles of pipelines in total; approximately 184 miles of pipeline carry crude oil, 454 miles of pipeline carry natural gas, and 499 miles of pipeline carry refined petroleum products (Indiana Geological Survey, 2002). The SA contains the fourth largest concentration of crude oil pipelines, seventh highest concentration of natural gas pipelines, and the second highest concentration of refined product pipelines.

2.6 Dams and Non-Levee Embankments

There are currently 13 known low head dams within the SA (IDNR DOW, 2016), accounting for the highest concentration of any SA at one low head dam per 46 square miles. Additionally, ten of the 13 low head dams are located within state designated salmonid streams. There are currently 16 state regulated high head dams documented within the SA (IDNR DOW, 2016) at a density of one dam per 38 square miles, comprising 2% of documented high head dams statewide.

Per the NLE GIS analysis (IDNR, 2016), there are approximately 126,625 linear feet (24 miles) of NLE's mapped within the SA, averaging one mile of NLE per 25 square miles, ranking sixth in NLE density among all SAs. Approximately 19 miles of NLE's in this SA are located within predominantly developed areas, indicating that many of the mapped NLE may be road and rail embankments, and/or berms along channelized/maintained waterways. The remaining NLE's are mapped in rural or agricultural settings.

2.7 Energy Production and Mining

2.7.1 Natural Gas and Oil Production

The Calumet-Dunes SA contains minimal natural gas and oil production. The Indiana Geological Survey (IGS) identifies one petroleum gas field and a single associated gas well ranking the Calumet-Dunes SA last in producing statewide for natural gas and oil fields (Indiana Geological Survey, 2015). Although the amount of petroleum fields ranks at the bottom, the IGS petroleum wells data identifies 177 exploratory wells, ten stratigraphic wells, ten waste disposal wells and one observation well within the SA boundary (Indiana Geological Survey, 2015)

2.7.2 Mineral Mining and Aggregates

The Calumet-Dunes SA contains active mineral operations that extract and produce commodities. Based on Indiana Geological Survey (IGS) 2016 active Indiana industrial mineral production data, this SA currently contains one sand & gravel and one crushed stone operation (Indiana Geological Survey, 2016). In addition to the extraction of raw material aggregates, the SA includes industry byproducts commodities that are used as aggregate. The IGS identifies nine active slag and two active lime producers' within the SA (Indiana Geological Survey, 2016). Northwest Indiana experiences little mining of natural materials, resulting in extensive use of slag generated from Indiana steel mills as aggregate (Indiana Geological Survey, 2016). Relative to the Calumet-Dunes Service Area size, mineral mining in the SA is tied for second to last in the state with 13 active operations.

2.7.3 Coal

The Calumet-Dunes SA does not have recoverable coal reserves and contains no active surface or underground coal mines.

2.8 Indiana State Wildlife Action Plan (SWAP) Identified Threats

The Calumet-Dunes SA is located entirely within the Indiana SWAP Great Lakes Planning Region. The SWAP identifies the most significant threats to habitats and SGCN within the Great Lakes Region as:

- Habitat conversion and loss
- Natural systems modification
- Invasive species
- Dams
- Fish passage
- Point and non-point source pollution
- Water management and use
- Housing and urban areas
- Commercial and industrial areas
- Agriculture, aquaculture, livestock
- Roads and service corridors
- Changing frequency, duration, and intensity of drought and floods

The SWAP Great Lakes Region has experienced loss in the majority of habitat types over the last decade mostly to urban development, which gained 6.2% in land cover (SWAP, 2015).

2.9 Anticipated Threats

The existing land uses within the developed and agricultural footprints make up 63% of the land cover within the SA and are expected to remain as the top contributors to aquatic resource impairments. This region has grown by more than 4% over the last two decades reaching a record peak population of 771,815 in 2010 (NIRPC, 2011). This growth trend is expected to continue with an additional 170,000 people and 80,000 new jobs targeted by 2040 per the Northwestern Indiana Regional Planning Commission's 2040 Comprehensive Regional Plan (CRP) (NIRPC, 2011).

IDNR expects development and transportation projects to remain the foremost permitted activities requiring mitigation for aquatic resource impacts if the 404 permitting trends of the past 7 years continue. The urban core of this SA has experienced population decline over the past 30 years, shifting

population growth centers to relatively undeveloped areas (NIRPC, 2011). The regions expected growth in conjunction with development patterns of the past several decades suggests new residential and commercial construction and road projects as likely to continue into the foreseeable future. With urban cores in population and industry decline, aquatic resource impacts are expected to occur in these high intensity areas as regional economic plans call for residential, commercial and industrial revitalization (NWIEDD, 2016). Additionally, public transportation options are expected to increase (NWIEDD, 2016), which may lead to more passenger rail development and/or added bus lanes within the region to support greater metropolitan area connectivity to Chicago and its suburbs.

Finally, while there have been a number of remediation and/or restoration projects in the more heavily contaminated portions of the SA (especially Hammond, Gary, East Chicago, and Whiting), there are still numerous clean-up activities to be completed on upland sites that could have potential impacts to adjacent aquatic resources as well as remedial actions and restoration activities that could improve existing aquatic resources within the region. Additionally, there is still remedial and restoration work yet to be completed within the Grand Calumet River itself, some of the adjacent wetlands to the river, and throughout this SA.

2.10 Offsets to Threats

IDNR will apply the same restoration, enhancement and/or preservation approaches to help offset the predominant threats in the Calumet-Dunes SA that were stated in the statewide portion of the CPF. The SA goals and objectives further define the general types and locations of the aquatic resources IDNR will provide as compensatory mitigation based upon identified threats, historic loss and current conditions. See **Appendix C** for a summary of offsets per major anthropogenic category and a general matrix of offset measures for each of the predominant threats to aquatic resources throughout the SA and the state.

ELEMENT 3. HISTORIC AQUATIC RESOURCE LOSS

The Calumet-Dunes SA historic aquatic resources were comprised of a diverse mix of natural aquatic community types that are a product of Lake Michigan and the surrounding landscape. The biological diversity of the Grand Calumet River Basin is associated to the convergence of three major biomes which includes eastern deciduous forest, boreal forest and tall grasslands, succession over a small area, and the large variations of the hydrological regimes associated with its streams, lakes and wetlands (Nevers, Whitman, & Gerovac, 1999/2000). Diversity of the aquatic resources within this region suffered from European settler's alterations of the landscape. The regions dense forest land was cleared and land was cultivated extensively as European settlement began in 1832 (Nevers, Whitman, & Gerovac, 1999/2000). As settlement increased due to westward expansion, commerce and industry started to dominate the landscape. The natural and wetland ecosystems of the region have been cleared, drained, fragmented and cut by railways and roadways created to facilitate industrial,

commercial, municipal and urban development, which led to the introduction of non-native, invasive species which has a cumulative negative effect on regional habitat destruction (Nevers, Whitman, & Gerovac, 1999/2000).

The draining and filling of wetlands to fulfill the development needs of industry, agriculture and other purposes coupled with the suppression of fire within the region has resulted in a few small remnants of the original natural landscape (Bacone & Campbell, 1980). Due to extensive aquatic resource loss within the Calumet-Dunes SA, understanding the region's aquatic resources and the natural communities in which they existed is best reconstructed by evaluating the identified Natural Regions and Sections and their related natural aquatic communities associated within each respective Region and Section. **Figure 24** depicts each Natural Region and Section located within the Calumet-Dunes SA. In addition to the natural communities, the utilization of studies on Indiana's historic vegetative cover and mapped hydric and partially hydric soils provide further insight into the general location and makeup of the historic aquatic resources within the region prior to early European settlement. **Table 20** provides a compilation of the best available information and published studies specific to the SA in order to provide insight on aquatic resource loss. The table details the Calumet-Dunes SA estimated land cover percentages for each region and section, and identified natural communities, estimated hydric and partially hydric soils, and estimated forest cover (Homoya, Abrell, Aldrich, & Post, 1985); (General Land Office, 1799-1834); (NRCS-USDA, 2016).

Natural Region(s)	Natural Region: Section(s)		Natural Region Community Types	Hydric Soils		Partially Hydric		Pre-Settlement Forest Cover
	Name	%		Acres	%	Acres	%	%
Northwestern Morainal	Lake Michigan Border	8.89	Beach community; the high dunes (mesophytic forest and savanna); pannes	88,520	23	50,419	13.1	72.3
	Chicago Lake Plain	45.07	Marsh, lake, sand savanna, sand prairie, and swamp; along with minor areas of various forest types					
	Valparaiso	45.8	Predominantly forested (eastern); fen, bog, lake, marsh, savanna, seep spring, and swamp					
Grand Prairie	Kankakee Sand	0.25	Predominantly prairie and savanna; wet prairie, marsh, swamp, wet sand flat, and wet muck flat; predominantly oak forest (eastern), oak flatwoods (dunal swales)					

Table 20: The historic natural community composition for the Calumet-Dunes Service Area based upon the natural region and section

Calumet-Dunes Service Area Natural Regions and Sections

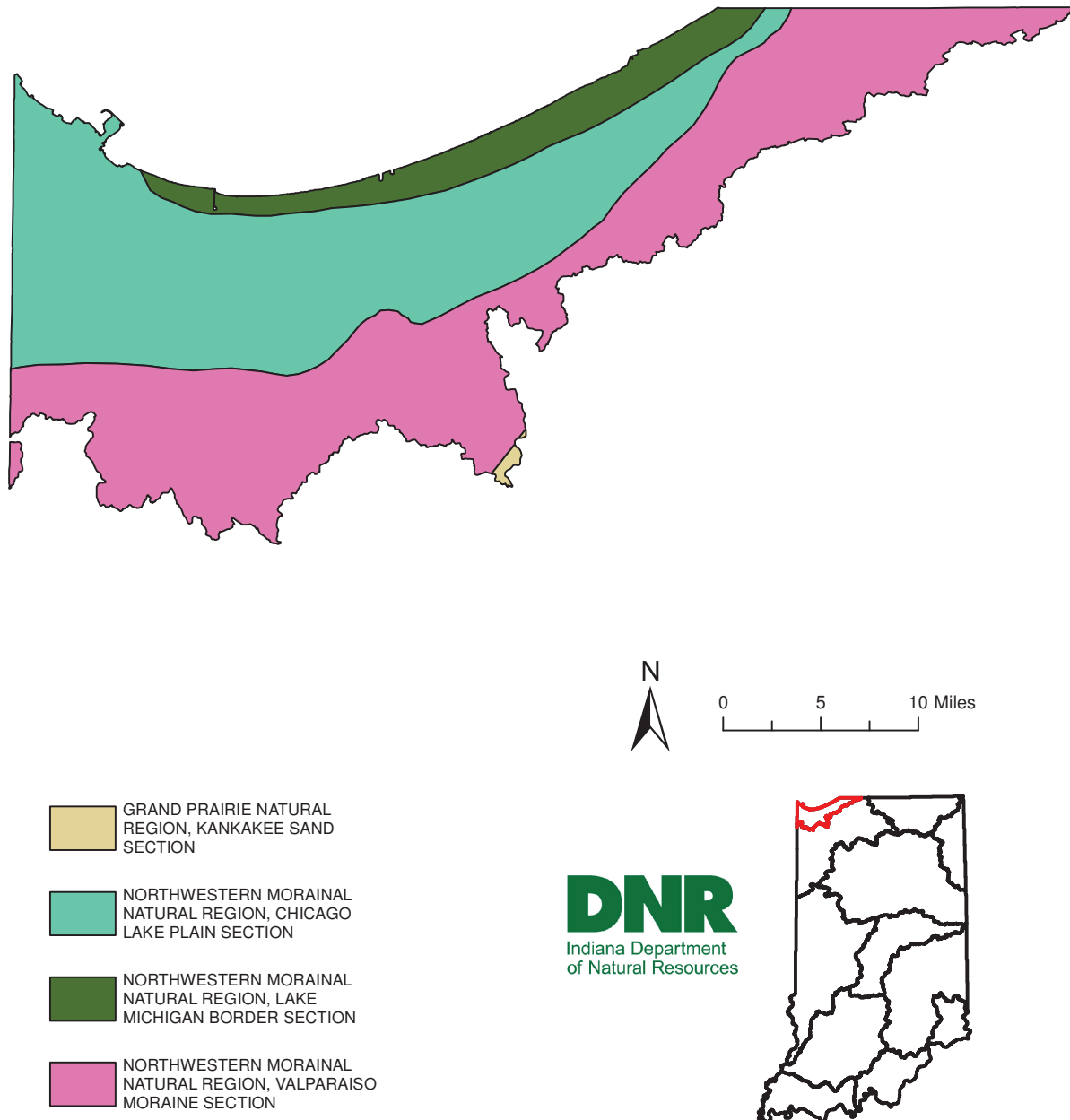


Figure 24. Calumet-Dunes Service Area – Natural Regions and Sections (Homoya, Abrell, Aldrich, & Post, 1985)

ELEMENT 4. CURRENT AQUATIC RESOURCE CONDITIONS

4.1 Streams and Rivers

GIS analysis of 303(d) category 4A and 5 impaired streams indicates there are currently 477 miles of category 4A impaired streams and 240 miles of category 5 impaired streams documented in the SA. IDEM reported E. coli (416 miles), dissolved oxygen (119 miles), impaired biotic communities (135 miles), nutrients (22 miles), and PCB's in fish tissue (47 miles – Category 5 only) as the leading causes of stream impairments within the service area (IDEM-IR, 2016). There are stream reaches in which multiple impairments may occur; therefore there is some overlap with the impaired stream miles.

As of 2014, IDEM conducted QHEI assessments of 331 stream reaches within the SA (**Table 21** and **Figure 25**) (IDEM OWQ, 2014). Though QHEI is intended for warm water communities, 156 assessment reaches were conducted within salmonid streams which are also capable of supporting a salmonid fishery (some put-and-take trout fishing) per the Indiana Water Quality Standards, 327 IAC 2-1-.5-5 (a)(3). Of the stream and river habitat reaches assessed, only 9.4% are capable of supporting a balanced warm water community.

QHEI Score Ranges	Narrative Rating	Count	Percent of Total
<51	Poor Habitat	199	60.1
51-64	Habitat is partially supportive of a stream's aquatic life design	101	30.5
>64	Habitat is capable of supporting a balanced warm water community	31	9.4
	Total	331	100%

Table 21. IDEM Overall QHEI scores for Calumet-Dunes SA, 1991 – 2014 (IDEM OWQ, 2014)

As previously discussed, the functions and services provided by forests are important to the ecological health of aquatic resources in all portions of the SA that were historically forested. Analysis of the 2011 NLCD indicates that the Calumet-Dunes SA ranks sixth overall in forested cover density of all SA's at 15% of total area with approximately 56,305 acres, and is the SA with the smallest percentage of forested cover with approximately 1.1% of 5,215,169 acres of forest cover statewide.

GIS analysis indicates that there are approximately 378,082 linear feet (72 miles) of stream located within 100 feet of agricultural fields. Under these criteria, the Calumet-Dunes SA has the smallest ratio of these potentially restorable stream miles to square miles of SA at approximately 0.12 mile of potential restoration per one square mile, or one mile of potential restoration for every 8.4 square miles of SA.

Calumet-Dunes Service Area Qualitative Habitat Evaluation Index (QHEI) Scores

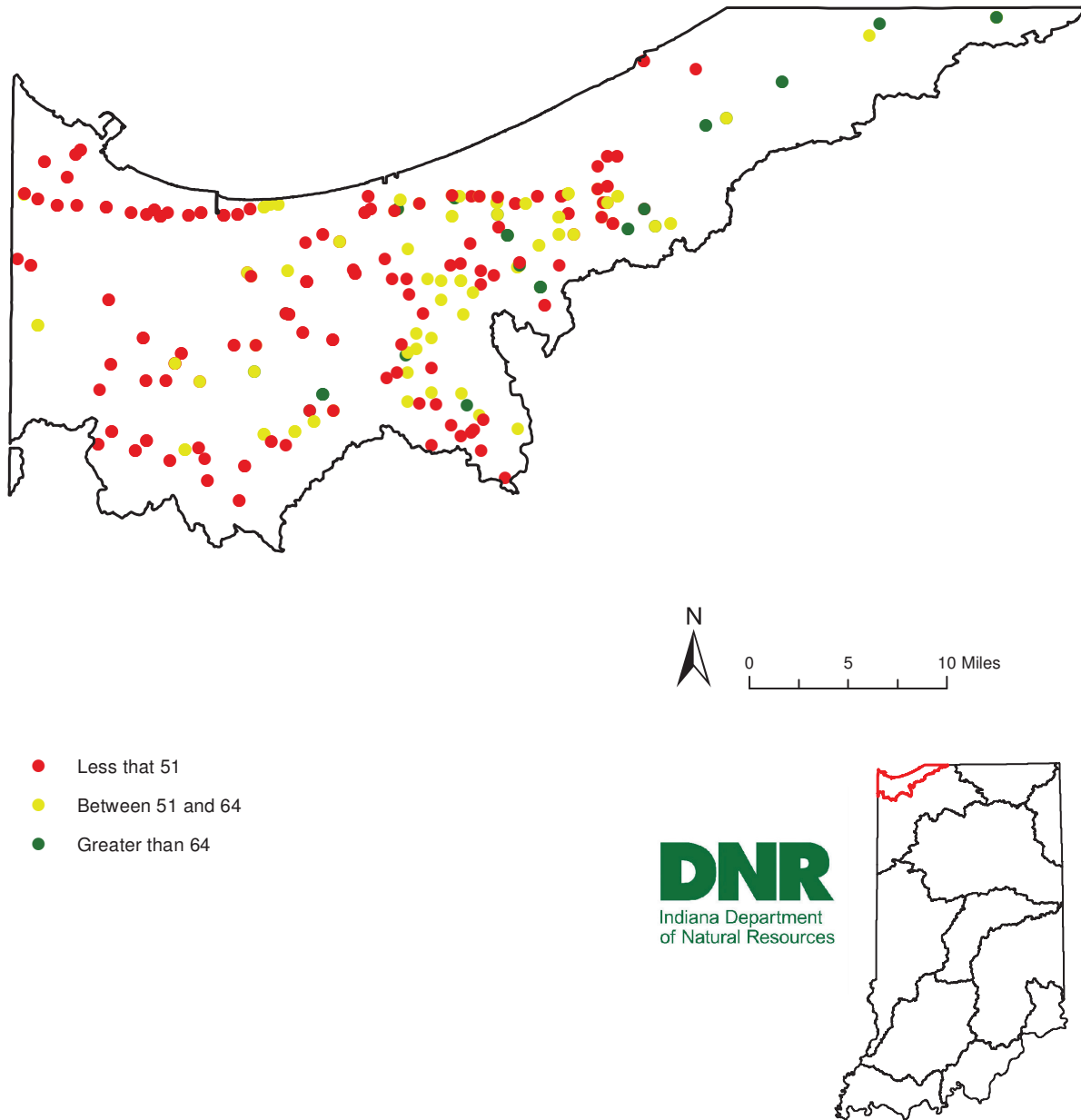


Figure 25. IDEM overall QHEI scores within the Calumet-Dunes service area; 1991-2014 (IDEM OWQ, 2014)

4.2 Wetlands

Analysis of the NWI (USFWS NWI, 2015) in the Calumet-Dunes SA shows that there are approximately 10,453 acres of freshwater emergent wetland (PEM) and approximately 24,326 acres of combined freshwater forested (PFO) and scrub-shrub (PSS) wetlands, accounting for approximately 9% of the total SA acreage. All of the aquatic resource types from the NWI combined account for approximately 15.4% of the total SA (**Table 22** and **Figure 26**). In addition to the many high quality natural aquatic community types within this region, the Calumet-Dunes SA contains rare dune and swale ecosystems which provide important habitat for wildlife and is characterized by upland dune ridges and low-relief wetlands along Lake Michigan's 59 miles of Indiana shoreline. Prior to settlement, dune and swale ecosystems covered an area of roughly 10,000 acres; today, only 1,000 acres remain as a result of habitat alteration and contamination by various sources (USFWS, 2001).

Aquatic Resource Type	Sum of NWI Aquatic Resource ACRES in SA	Percent of Total NWI Aquatic Resource Acres in SA	Percent of SA Total Acres	Percent of Total State Area –Acres
Freshwater Emergent Wetland	10,452.63	17.61%	2.71%	0.04%
Freshwater Forested/Shrub Wetland	24,325.48	40.98%	6.31%	0.10%
Freshwater Pond	4,863.60	8.19%	1.26%	0.02%
Lake	18,961.77	31.95%	4.92%	0.08%
Riverine	753.35	1.27%	0.20%	0.00%
Grand Total	59,356.82	100.00%	15.41%	0.25%

Table 22. Acres and percentage of acres of aquatic resource types from NWI analysis (USFWS NWI, 2015)

Hydric and partially hydric soils (NRCS-USDA, 2016) account for 138,940 acres (**Figure 27**), or 36% land cover within the SA, out of which approximately 18,251 acres have the potential to be restored, accounting for 4.75% of the total SA. This was determined by mapping current hydric and partially hydric soils data with potentially restorable land cover types (e.g., cropland, pasture), excluding PFO, PSS and PEM wetlands from the NWI within agricultural land use. The Calumet-Dunes SA has the third least percentage of recoverable wetland acres to total SA size of all SA's, and the least amount of potentially restorable wetland acres of any SA. This is partially due to SA size, but also reflects the high intensity developed land use due to its proximity to Chicago.

Calumet-Dunes Service Area National Wetlands Inventory

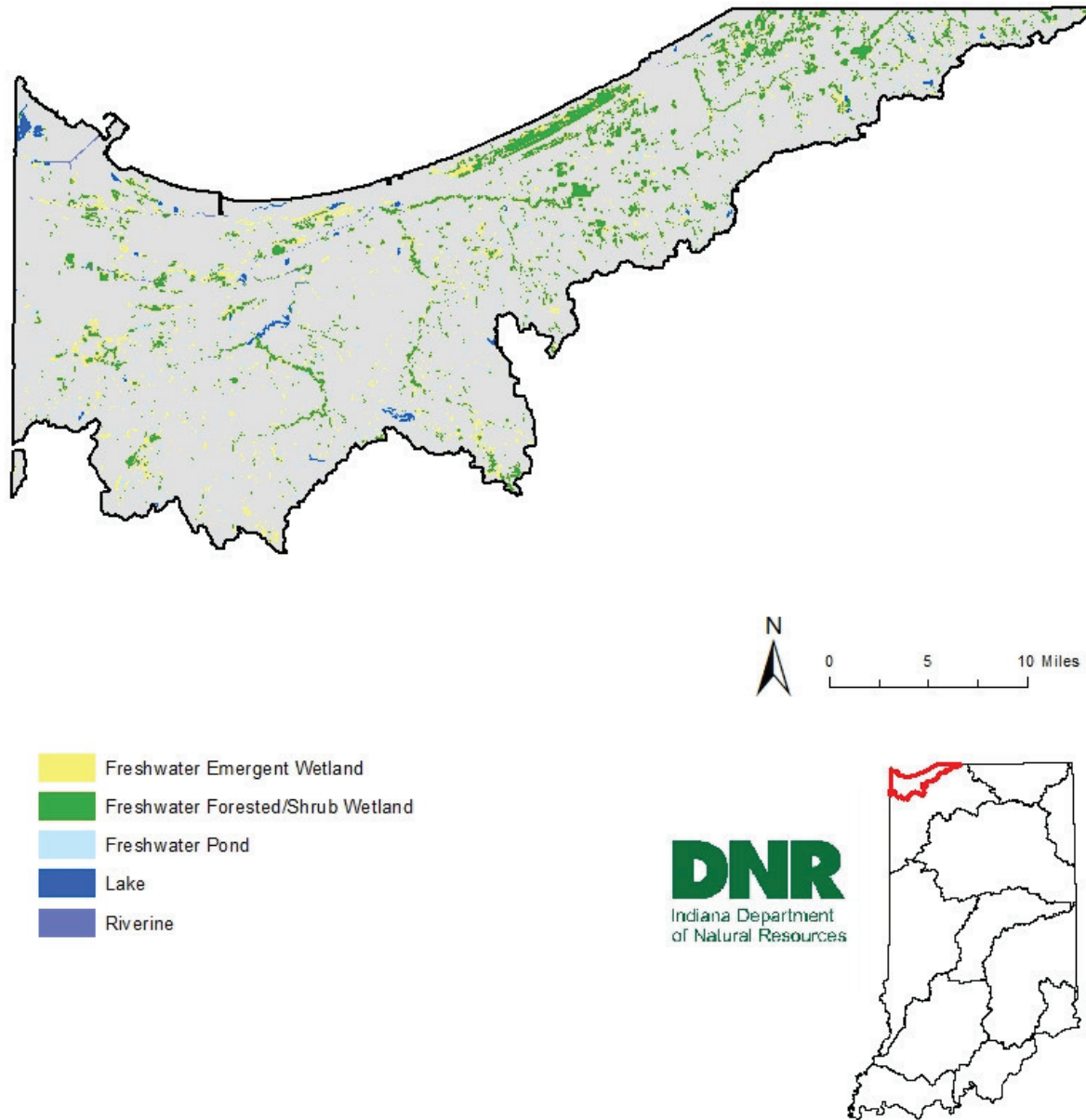


Figure 26. NWI within the Calumet-Dunes service area (USFWS NWI, 2015)

Calumet-Dunes Service Area Hydric Soils

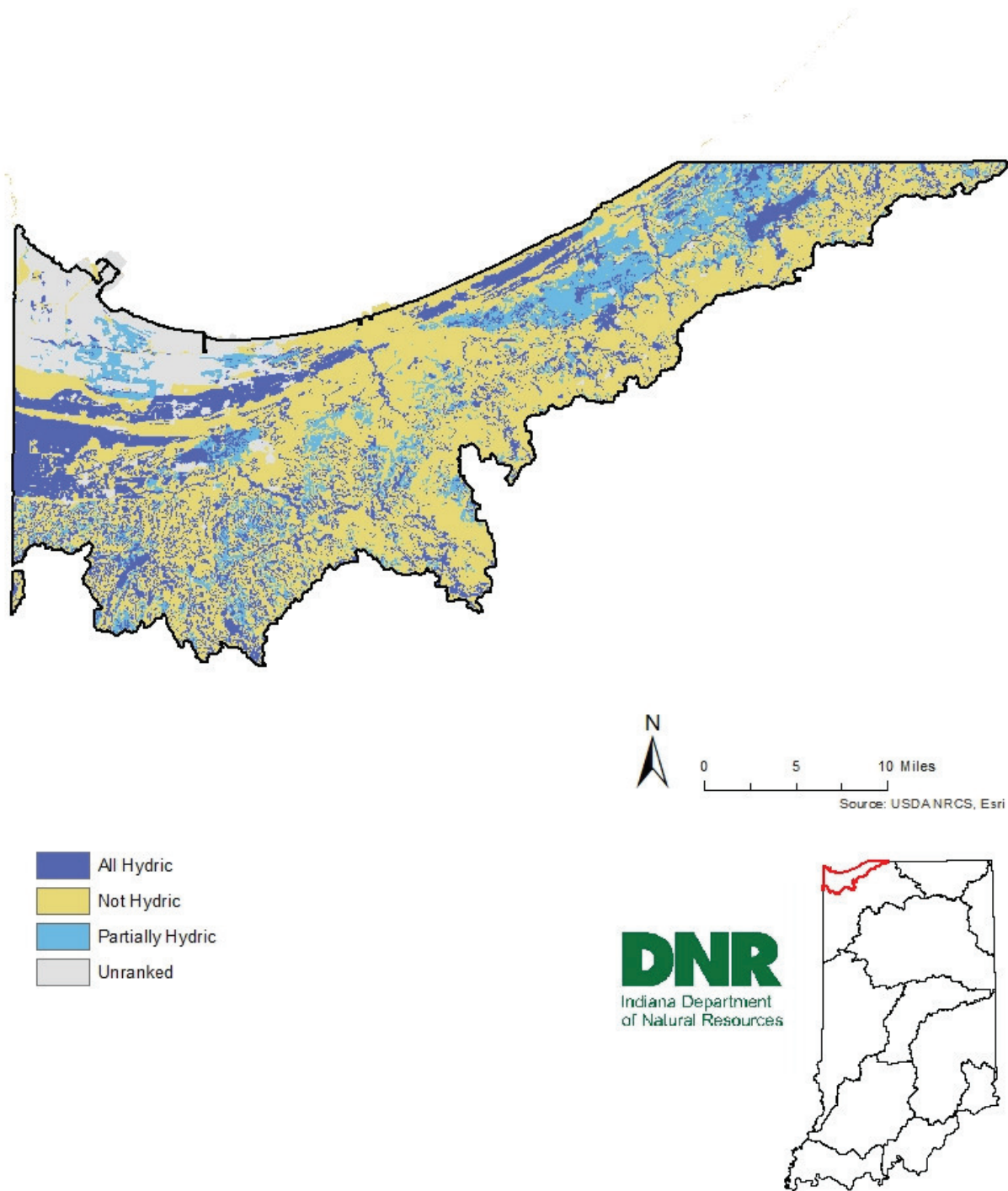


Figure 27: Hydric soils within the Calumet-Dunes service area (NRCS-USDA, 2016)

4.3 Concentrations of Potentially Restorable Wetlands and Streams

GIS hotspot analysis was conducted to document concentrations of the identified potentially restorable wetlands and streams. Hotspots account for 14,905 acres of potentially restorable wetlands within the SA. The watershed with the highest concentration of potentially restorable wetlands is Kemper Ditch-East Arm Little Calumet River (HUC 040400010403; **Table 23**). Hotspots account for 120,766 linear feet of potentially restorable streams within the SA. The watershed with the highest concentration of potentially restorable streams is Duck Creek (HUC 040400010508; **Table 24**). The watersheds with the highest concentrations of potentially restorable streams and wetlands (**Tables 23 and 24**) serve as the basis of identification of areas that have experienced the most recoverable aquatic resource loss within the SA. **Figure 28** shows where these watersheds are located within the SA.

There are 367 acres of potentially restorable wetlands on IDNR-owned lands within the SA. There are 1,986 acres of hotspots of potentially restorable wetlands adjacent to IDNR-owned lands within the SA. Reynolds Creek Gamebird Habitat Area is the IDNR-managed land with the most adjacent hotspots of potentially restorable wetlands (1,160 acres). The only other IDNR-managed lands adjacent to hotspots of potentially restorable wetlands are Beaver Dam Wetland Conservation Area (687 acres) and Calumet Prairie (139 acres).

HUC 12 Code	HUC 12 Name	Hotspots of Potentially Restorable Wetlands (acres)
040400010403	Kemper Ditch-East Arm Little Calumet River	2,466
040400010504	Main Beaver Dam Ditch-Deep River	2,003
040400010206	Headwaters South Branch Galien River	1,448
040400010105	East Branch Trail Creek	1,329
040400010502	Headwaters Main Beaver Dam Ditch	1,192

Table 23. Watersheds in the Calumet-Dunes Service Area with the highest concentration of potentially restorable wetlands

HUC 12 Code	HUC 12 Name	Hotspots of Potentially Restorable Streams (linear ft)
040400010508	Duck Creek	22,328
040400010507	Deer Creek-Deep River	22,208
040400010504	Main Beaver Dam Ditch-Deep River	20,458
040400010206	Headwaters South Branch Galien River	20,028
040400010502	Headwaters Main Beaver Dam Ditch	19,083

Table 24. Watersheds in the Calumet-Dunes Service Area with the highest concentration of potentially restorable streams

Calumet-Dunes Service Area

Concentrations of Potentially Restorable Streams and Wetlands

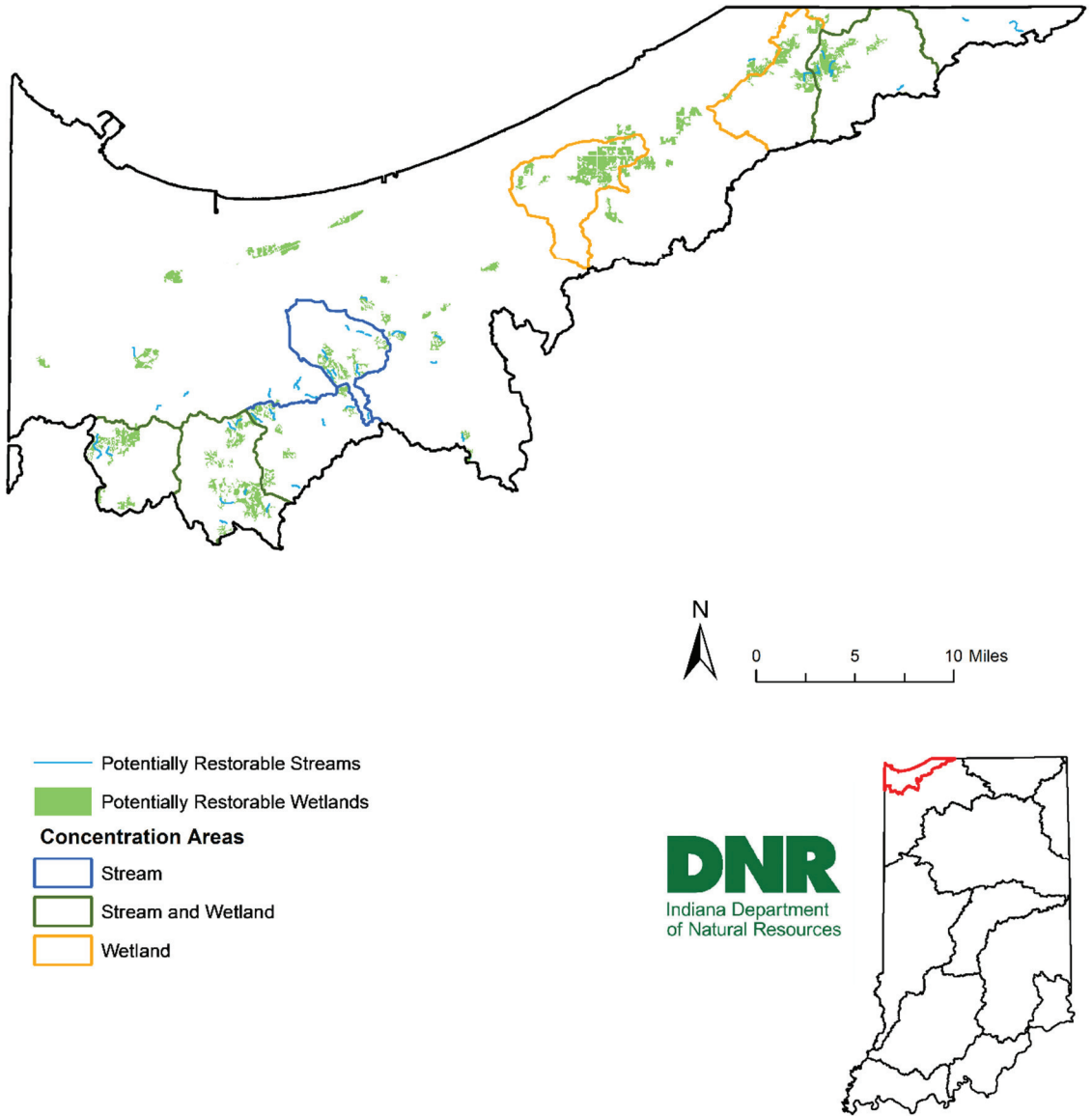


Figure 28. Concentrations of Potentially Restorable Streams and Wetlands in the Calumet-Dunes Service Area

4.4 Lakes, Reservoirs and Ponds

Lake Michigan is assessed as a single unit, and therefore any impairment documented in the lake is applied to all 154,176 acres in Indiana (IDEM-IR, 2016) (**Table 25**). The entirety of Lake Michigan does not support human health and wildlife (fishable use). The majority of Indiana's 59 miles of Lake Michigan shoreline, excluding Indiana Harbor, fully support aquatic life use. Only 7% of Lake Michigan's shoreline waters support full body contact recreation use, and all 59 miles of shoreline were impaired for fish consumption. Impairments along Lake Michigan's shoreline include E. coli as well as PCB's and mercury in fish tissue. These impairments have causes such as septic systems, illicit connections to storm sewer discharges, shorebirds along Indiana beaches, non-point sources, and unknown sources (IDEM-IR, 2016).

Designated Beneficial Use	Total Size	Size Assessed	Percent Assessed	Sized Fully Supporting	Size Not Supporting
Full Body Contact (Recreational Use)	59	59	100%	4	55
Human Health and Wildlife (Fishable Use)	59	59	100%	0	59
Public Water Supply	31	31	100%	31	0
Warm Water Aquatic Life (Aquatic Life Use)	59	59	100%	59	0

Table 25. Summary of Lake Michigan designated use support (IDEM-IR, 2016)

Landward of Lake Michigan there are currently 435 acres of total documented impaired lake waters consisting of Category 5 phosphorous impairments in Wolf Lake and PCB's in fish tissue within Marquette Park Lagoons East and West (IDEM-IR, 2016).

The 2011 NLCD identifies approximately 4,115 acres of open water landward of Lake Michigan which is 1.1% of the SA. This varies from the NWI, which identifies approximately 4,863 acres of freshwater ponds comprising 1.3% of the SA, and 18,962 acres of lakes comprising 4.9% of total SA acres.

Of these open waterbodies, GIS analysis indicates there are seven (7) natural public freshwater lakes (PFL) within the SA (IDNR DOW PD, 2016), which is only 1.6% of the 425 PFL's as identified by the Indiana Natural Resource Commission list of PFLs as of June 2011 (IN NRC, 2011). Furthermore, GIS analysis indicates that approximately 1,754 acres of PFO, PSS and PEM from the NWI are contiguous with the boundary of PFL's within the SA as identified in the DNR DOW's GIS data. IDNR will remain up to date with PFL, reservoir and Lake Michigan condition data from sources such as IDEM, the Indiana Clean Lakes Program, watershed management plans, lake associations and the like as the landscape-watershed approach is utilized to identify aquatic resource needs within the SA.

4.5 Ground Water and Surface Water Interaction

Considerations afforded by the data utilized below include, but are not limited to, helping identify potential areas in need of increased ground water recharge and/or identifying sensitive aquifers in need of increased buffering and protection from potential contamination threats.

Analysis of the near surface aquifer recharge rate GIS data from IGS (Letsinger S. L., 2015) for the Calumet-Dunes SA shows that shallow unconsolidated aquifers in this SA are predominantly in the median range of inches of recharge per year (**Table 26**).


Recharge Rate	Inches/Year	Square Miles	Percent of Calumet-Dunes SA
	14	0.92	0.15%
	13	1.71	0.29%
	12	1.63	0.27%
	11	1.59	0.27%
	10	1.83	0.31%
	9	10.62	1.78%
	8	112.10	18.80%
	7	163.51	27.43%
	6	113.04	18.96%
	5	124.90	20.95%
	4	54.35	9.12%
	3	7.98	1.34%
	2	1.97	0.33%
	1	0.04	0.01%

Table 26. Approximate ground water recharge rates in the Calumet-Dunes Service Area (Letsinger S. L., 2015)

Analysis of the IGS near surface aquifer sensitivity mapping (Letsinger S. , 2015) indicates that the majority of the Calumet-Dunes SA near surface aquifers are moderately to highly sensitive to contamination (**Table 27**). The aquifer sensitivity reflects the middle to upper range of aquifer recharge rates in addition to a dominance of developed and agricultural land uses that may contribute to ground water contamination.

Sensitivity	Square Miles	Percent of Total Acre
Very High	12	2%
High	379	63%
Moderate	192	32%
Low	18	3%
Very Low	0	0%

Table 27. Ground water sensitivity in the Calumet-Dunes Service Area (Letsinger S. , 2015)

Analysis of the DNR Division of Water's Water Rights Section 2015 significant water withdrawal facilities data shows the Calumet-Dunes SA has the most registered capacity of surface water withdrawal of any SA, with a 2015 registered surface water withdrawal capacity of 684,417 million gallons a day (MGD) (**Figure 29**) (IDNR DOW, 2016). The sectors of energy production, industry, and public water supply have the most significant registered withdrawal capacities with a combined total of 99.6% of withdrawal potential, which reflects the developed land uses of the SA.

Calumet-Dunes Service Area 2015 Surface Water Use (Million Gallons Per Day)

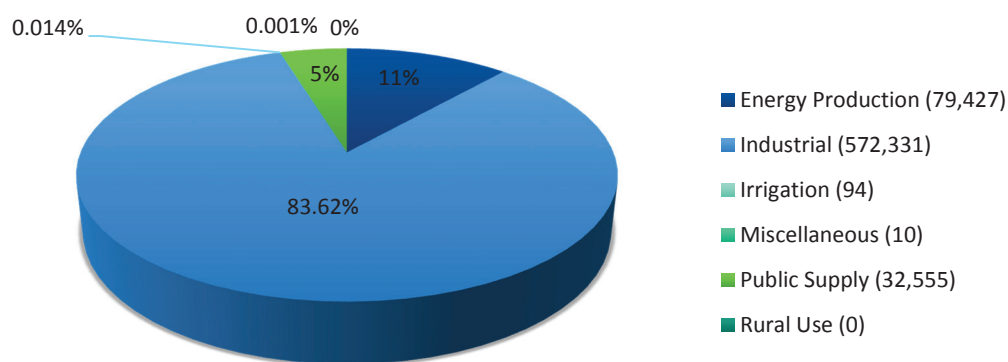


Figure 29. Significant Water Withdrawal Facilities-Surface Water (IDNR DOW, 2016)

On the contrary, significant ground water withdrawal ranks at the bottom among the SA's with approximately 1.7 MGD of registered withdrawal capacity in 2015 (**Figure 30**).

Calumet-Dunes Service Area 2015 Groundwater Use (Million Gallons Per Day)

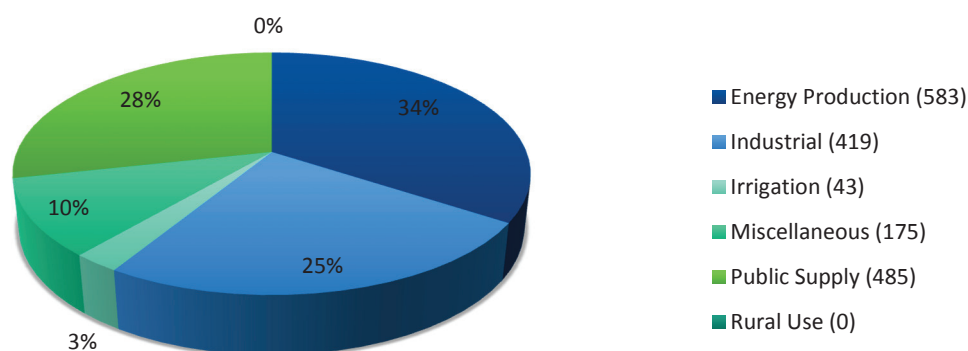


Figure 30. Significant Water Withdrawal Facilities-Groundwater (IDNR DOW, 2016)

4.6 High Quality Aquatic Resources and Natural Communities

Analysis of the DNR salmonid stream GIS dataset indicates there are approximately 677,345 linear feet (128 miles) of salmonid streams in the Calumet-Dunes SA, approximately double the salmonid stream miles in the St. Joseph River SA.

The Indiana portion of Lake Michigan and all waters incorporated in the Indiana Dunes National Lakeshore are designated as Outstanding State Resource Waters.

High quality natural communities currently documented in the Natural Heritage Database within the SA include, but are not limited to boreal flatwoods, wet prairie, wet sand prairie, fen, marsh, sedge meadow, panne, circumneutral seep, circumneutral bog, forested swamp, scrub-shrub swamp, wet floodplain forest, acid bog, natural lakes, inland coastal plain marsh, and foredune (dune and swale).

There are currently five amphibian species, 47 bird species, 10 fish species, 11 mammal species, eight mollusk species, and nine reptile species listed as SGCN within the Indiana SWAP Great Lakes Planning Region which includes the Calumet-Dunes SA (SWAP, 2015).

ELEMENT 5. AQUATIC RESOURCE GOALS AND OBJECTIVES

Aquatic resource goals and objectives identified in the statewide CPF also apply to the Calumet-Dunes SA. The following aquatic resource goals and objectives apply specifically to the Calumet-Dunes SA based on 404 permitted impact trends, predominant threats, historic loss, impaired and high quality current aquatic resource conditions, habitats and SGCN, and current and future priority conservation areas. The general amounts of aquatic resources IDNR will seek to provide will depend on ILF credit demand.

1. Restoration, enhancement and preservation of aquatic resources to help offset the dominant and anticipated threats in the SA.
2. Implement stream and wetland restoration, enhancement and/or preservation projects to support Lake Michigan coastal habitat connectivity, preserve high quality habitats that are not yet protected, and improve coastal aquatic resource functions and services.
3. Re-establishment of historic aquatic resources that have experienced high concentrations of loss, fragmentation and/or impairment, such as the identified concentrations of potentially restorable streams and wetlands to include any channel restoration needs.
4. Implement projects within and adjacent to current and future areas identified as conservation priorities by federal, state and local government entities, and non-governmental organizations (stakeholder involvement/conservation partnerships).
5. Preservation, enhancement and/or restoration of globally rare dune and swale habitats and other high quality aquatic resource types within this SA will be a priority in accordance with 33 CFR §332.3(h) of the Federal Mitigation Rule.
6. Implement natural stream channel restorations in order to help offset chemical, physical and biological impairments and degradation resulting from anthropogenic activities.

7. Restoration of in-stream habitat, structural integrity and riparian cover of salmonid streams critical to SGCN and salmonid species to include potential removal or modification of dams.
8. Target stream, riparian and wetland restoration, enhancement and/or preservation projects in urbanized areas acknowledging the challenges and constraints that will likely occur within intensely developed areas in this SA.
9. Restoration, rehabilitation, enhancement and/or preservation of aquatic resources within the Grand Calumet River watershed.
10. Support critical habitat restoration for federal and state listed SGCN within and adjacent to aquatic resources while applying the SWAP identified conservation needs and actions in the Great Lakes Planning Region where feasible.
11. Restoration of migratory bird aquatic habitat as identified in the Great Lakes Restoration Initiative and/or other applicable initiatives or studies.

ELEMENT 6. PRIORITIZATION STRATEGY

The four steps below present the prioritization criteria for mitigation site identification and selection. This prioritization strategy will be used for project selection within each SA. When prioritizing sites for mitigation projects, the following core criteria shall be utilized.

1. Mitigation site proposals must contain the ability to result in a successful and sustainable net gain and/or preservation of aquatic resource functions and services and/or result in no net loss of Indiana's aquatic resources.
2. Prioritization will be given to compensatory mitigation projects that provide the greatest benefit to the Calumet-Dunes SA, by providing the greatest ecological lift in aquatic resource functions and services based upon the specific needs identified within the SA and/or watershed utilizing the watershed approach for site selection.
3. Project proposals will consider how to help offset the anthropogenic threats to aquatic resources, historic loss, and existing and future impairments while achieving IN SWMP goals and objectives within the SA.
4. Other prioritization evaluation criteria may include, but are not limited to; cost, feasibility, size, proximity to other conservation lands or protected areas, connectivity or location with respect to corridors, human use value, and efficient long term maintenance.

In addition to the Core Criteria, information from conservation partners, landowners and additional stakeholders may also be utilized during the site selection process as they may have additional data or a pre-existing list of priority restoration projects. Ground investigations will be required to confirm or dismiss these datasets and determine the best locations for compensatory mitigation project sites.

Currently, the following watershed plans exist within the SA: Deep River-Turkey Creek WMP, NIRPC WMP, Dunes Creek WMP, Galena River WMP, Little Calumet WMP, Salt Creek WMP, and Trail Creek WMP. However, IDNR will utilize the most current watershed planning information that is available as these plans are updated and/or new watershed plans are developed within this SA over the life of the program.

ELEMENT 7. PRESERVATION OBJECTIVES

When applicable under 33 CFR §332.3(h) of the Federal Mitigation Rule, preservation objectives within the Calumet-Dunes SA will include rare dune and swale habitats, high quality natural aquatic and riparian communities, and critical habitat for SGCN. Additionally, there will likely be aquatic resource and habitat preservation and/or enhancement opportunities in coincidence with the primary objective of restoration to be determined on a per project basis and approved by the Corps/IRT.

ELEMENT 8. PUBLIC AND PRIVATE STAKEHOLDER INVOLVEMENT

Currently, the following land trusts exist within the SA: the Nature Conservancy of Indiana, the Shirley Heinze Land Trust, Inc. and the Woodland Savanna Land Conservancy. There is the potential for land trusts to dissolve, adjust their geographical boundaries, and for new land trust organizations to be created within the SA. IDNR intends to partner with land trusts that exist in the SA on compensatory mitigation projects to develop project plans and designs as well as providing long-term management and stewardship of subject properties over the life of the program.

Additional stakeholders' interest and potential conservation partnerships specific to the Calumet-Dunes SA, and in which IDNR is an interested party include, but are not limited to the following organizations and/or initiatives:

- Indiana Dunes National Lakeshore/National Park Service
- Municipal and County Governmental Entities
- Active Watershed Groups and appropriate Watershed Management Plans
- Lake, Porter, LaPorte and St. Joseph Counties Soil and Water Conservation Districts
- Great Lakes Restoration Initiative (GLRI)
- Great Lakes Environmental Assessment and Mapping Project
- NOAA Great Lakes Environmental Research Laboratory, and Habitat Conservation Restoration Center
- Northwestern Indiana Regional Planning Commission (NIRPC)
- Northwest Indiana Economic Development District
- Northwest Indiana Forum
- Upper Midwest and Great Lakes Landscape Conservation Cooperative (Coastal Wetland Decision Support Tools)
- Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperatives
- Government entities of bordering states
- Local and Great Lakes region academic institutions
- USGS Great Lakes Science Center

Currently known public, private and non-profit conservation priority areas as identified by the 2015 IWPP are shown in **Figure 31** below (IWPP, 2015).

Calumet-Dunes Service Area High Priority Aquatic Resource Conservation Sites

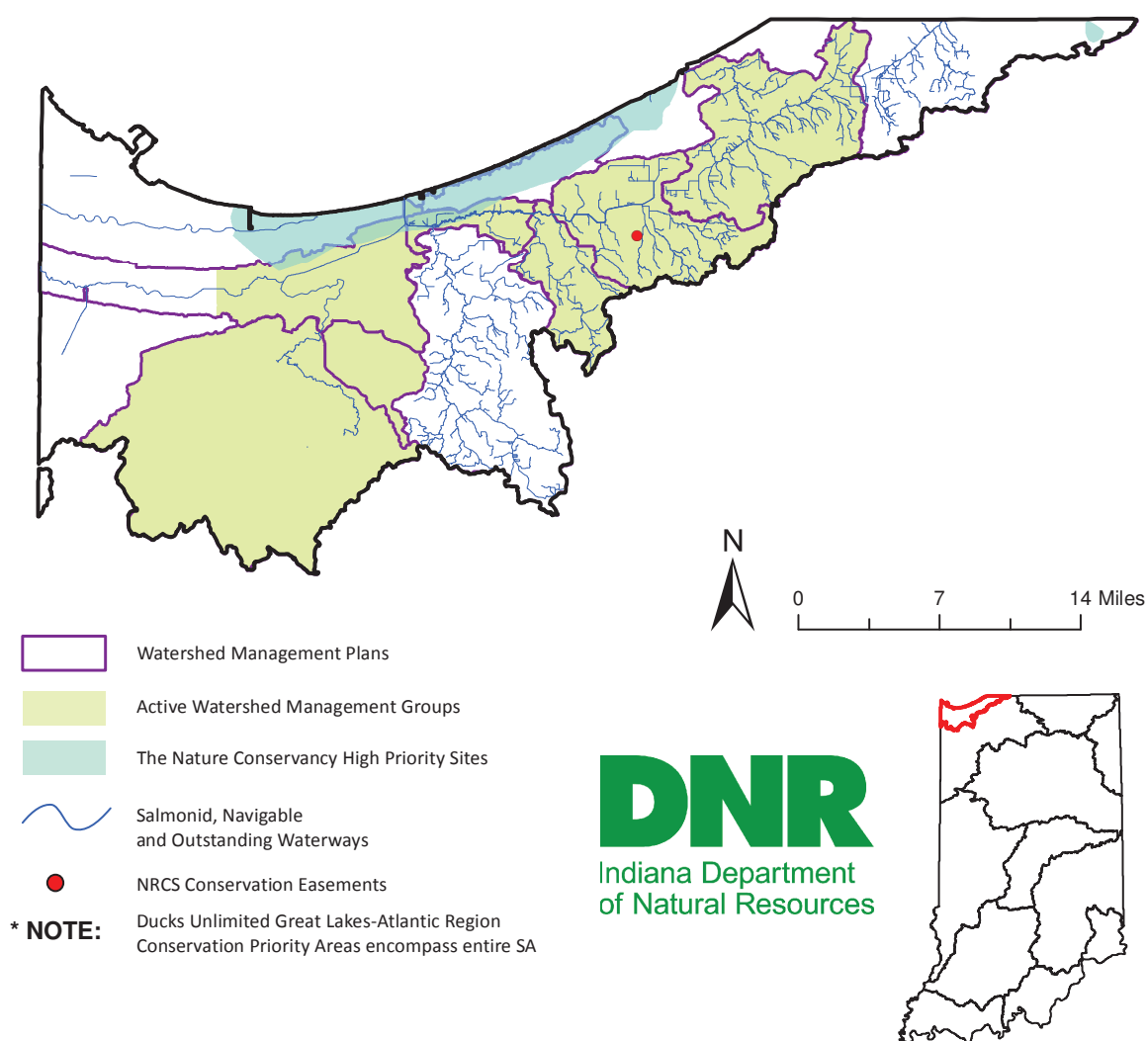


Figure 31. Priority conservation areas and sites; IDEM Wetland Program Plan (IWPP, 2015)

ELEMENT 9. LONG TERM PROTECTION AND MANAGEMENT

Long term protection and management strategies will be conducted in the same manner per SA as outlined in the statewide CPF.

ELEMENT 10. PERIODIC EVALUATION AND REPORTING

Periodic evaluation and reporting on the progress of IN SWMP will be conducted in the same manner per SA as outlined in the statewide CPF.